

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims**

1           1. (previously presented)    A method for sending data from a source to a destination,  
2    comprising:  
3           a host of the source providing to a sending agent of the source, virtual memory addresses  
4    of data to be sent to a destination wherein the data is stored in a plurality of unpinned physical  
5    locations of the source, each location having a physical address and a virtual memory address  
6    which is mapped to the physical address;  
7           the sending agent providing to the host of the source at least some of the virtual memory  
8    addresses of the data to be sent to the destination;  
9           the host of the source identifying to the sending agent the data addressed by the virtual  
10   memory addresses provided by the sending agent; and  
11          the sending agent sending the identified data to the destination.

1           2. (original)   The method of claim 1 wherein the host identifying data comprises the  
2    host providing to the sending agent the data addressed by the virtual addresses provided by the  
3    sending agent, said method further comprising the sending agent storing the data received from  
4    the host in a buffer of the sending agent.

1           3. (original)   The method of claim 1 wherein the host identifying data comprises the  
2    host providing to the sending agent the physical addresses of the locations containing the data  
3    addressed by the virtual memory addresses provided by the sending agent.

1           4. (original)   The method of claim 3 wherein the physical locations include locations of  
2    a first memory and locations of a second memory and the data identified by the host is stored in  
3    the first memory and the physical memory addresses provided by the host are physical memory  
4    locations of the first memory containing the data addressed by the virtual addresses provided by  
5    the sending agent, the method further comprising pinning the physical memory locations of the

6 first memory provided by the host to the sending agent to prevent the data addressed by the  
7 virtual addresses provided by the sending agent from being swapped to the second memory.

1 5. (original) The method of claim 4 further comprising:  
2 the sending agent retrieving from the pinned physical memory locations  
3 of the first memory, the data addressed by the virtual addresses provided by the sending  
4 agent; and  
5 unpinning the pinned physical memory locations of the first memory after  
6 the sending agent sends to the destination the data addressed by the virtual addresses  
7 provided by the sending agent.

1 6. (original) The method of claim 1 further comprising receiving from the  
2 destination an acknowledgment for data successfully sent by the sending agent and  
3 received by the destination; wherein the virtual memory addresses provided by the  
4 sending agent to the host are the virtual addresses of data sent by the sending agent to the  
5 destination but not acknowledged as successfully received by the destination.

1 7. (original) The method of claim 1 further comprising:  
2 receiving from the destination an acknowledgment for data successfully  
3 sent by the sending agent and received by the destination;  
4 the sending agent providing to the host the virtual addresses of data sent  
5 by the sending agent to the destination but not acknowledged as successfully received by  
6 the destination;  
7 the host identifying to the sending agent the unacknowledged data  
8 addressed by the virtual memory addresses provided by the sending agent; and  
9 the sending agent resending the identified unacknowledged data to the  
10 destination.

1 8. (original) The method of claim 1 wherein the host providing virtual  
2 addresses to the sending agent includes the host providing to the sending agent at least  
3 one data structure which includes in an address field containing the virtual address of one

4 of a plurality of memory locations storing a block of data to be sent to the destination, a  
5 size field containing a value representing the size of the block of data; and a sequence  
6 number field containing a value representing a packet sequence number associated with  
7 data within the block of data.

1 9. (original) The method of claim 1 wherein the host providing virtual  
2 addresses to the sending agent includes the host providing to the sending agent a plurality  
3 of data structures, wherein each data structure includes in an address field, the virtual  
4 address of one of a plurality of memory locations storing a block of data to be sent to the  
5 destination, a size field containing a value representing the size of the block of data, a  
6 sequence number field containing a value representing the packet sequence number  
7 associated with data within the block of data; and a link field containing the virtual  
8 address of another data structure of the plurality of data structures.

1 10. (previously presented) The method of claim 1 wherein the physical  
2 locations include locations of a first memory and a second memory and the data to be  
3 sent to the destination is stored in the first memory, the method further comprising,  
4 pinning the locations of the first memory storing the data to be sent to  
5 prevent the data to be sent from being swapped to the second memory;  
6 the host providing to the sending agent in addition to the virtual memory  
7 addresses of the data to be sent, the physical addresses of the locations of the first  
8 memory storing the data to be sent;  
9 the sending agent retrieving from the pinned locations of the first  
10 memory, the data to be sent; and  
11 unpinning the pinned locations of the first memory storing the data to be  
12 sent after the sending agent retrieves the data from the pinned locations of the first  
13 memory storing the data to be sent;  
14 and wherein the sending by the sending agent of the identified data to the  
15 destination includes sending the identified data in data packages over a network to the  
16 destination in accordance with at least a transport protocol.

11. (previously presented) A system adapted to communicate with a destination, comprising:

- memory;
- a processor coupled to the system memory;
- an operating system executable by the processor in memory;
- a network adaptor;
- data storage;
- a data storage controller adapted to manage Input/Output (I/O) access to the data storage; and
- a device driver executable by the processor in the memory,

wherein the memory and the data storage each comprise physical locations adapted to store data, each location having a physical address and a virtual address which is mapped to the physical address; and

wherein at least one of the operating system and device driver is adapted to provide a host and at least one of the device driver and the network adaptor is adapted to provide a sending agent wherein:

- (i) the host provides to the sending agent, virtual memory addresses of data to be sent to a destination wherein the data is stored in a plurality of unpinned physical locations of the memory,
- (ii) the sending agent provides to the host at least some of the virtual memory addresses of the data to be sent to the destination;
- (iii) the host identifies to the sending agent the data addressed by the virtual memory addresses provided by the sending agent; and
- (iv) the sending agent sends the identified data to the destination.

12. (original) The system of claim 11 wherein the system further comprises a buffer and wherein the host identifying data comprises the host providing to the sending agent the data addressed by the virtual addresses provided by the sending agent, and wherein the sending agent is further adapted to store the data received from the host in the buffer.

1           13. (original) The system of claim 11 wherein the host identifying data  
2 comprises the host providing to the sending agent the physical addresses of the locations  
3 containing the data addressed by the virtual memory addresses provided by the sending  
4 agent.

1           14. (original) The system of claim 13 wherein the data identified by the host is  
2 stored in the memory and the physical addresses provided by the host are physical  
3 locations of the memory containing the data addressed by the virtual addresses provided  
4 by the sending agent, the system further comprising pinning the physical memory  
5 locations of the memory provided by the host to the sending agent to prevent the data  
6 addressed by the virtual addresses provided by the sending agent from being swapped to  
7 the data storage.

1           15. (original) The system of claim 14 wherein the sending agent is further  
2 adapted to retrieve from the pinned physical memory locations of the memory, the data  
3 addressed by the virtual addresses provided by the sending agent; and  
4                   at least one of the sending agent and the host is further adapted to unpin  
5 the pinned physical memory locations of the memory after the sending agent sends to the  
6 destination the data addressed by the virtual addresses provided by the sending agent.

1           16. (original) The system of claim 11 wherein the sending agent is further  
2 adapted to receive from the destination an acknowledgment for data successfully sent by  
3 the sending agent and received by the destination; and wherein the virtual memory  
4 addresses provided by the sending agent to the host are the virtual addresses of data sent  
5 by the sending agent to the destination but not acknowledged as successfully received by  
6 the destination.

1           17. (original) The system of claim 11 wherein the sending agent is further  
2 adapted to:  
3                   receive from the destination an acknowledgment for data successfully  
4 sent by the sending agent and received by the destination; and

5 provide to the host the virtual addresses of data sent by the sending agent  
6 to the destination but not acknowledged as successfully received by the destination;  
7 wherein the host is further adapted to identify to the sending agent the  
8 unacknowledged data addressed by the virtual memory addresses provided by the  
9 sending agent; and  
10 wherein the sending agent is further adapted to resend the identified  
11 unacknowledged data to the destination.

1 18. (original) The system of claim 11 wherein the host providing virtual  
2 addresses to the sending agent includes the host providing to the sending agent at least  
3 one data structure which includes an address field containing the virtual address of one of  
4 a plurality of locations storing a block of data to be sent to the destination, a size field  
5 containing a value representing the size of the block of data; and a sequence number field  
6 containing a value representing a packet sequence number associated with data within the  
7 block of data.

1 19. (original) The system of claim 11 wherein the host providing virtual  
2 addresses to the sending agent includes the host providing to the sending agent a plurality  
3 of data structures, wherein each data structure includes an address field containing the  
4 virtual address of one of a plurality of memory locations storing a block of data to be sent  
5 to the destination, a size field containing a value representing the size of the block of  
6 data, a sequence number field containing a value representing the packet sequence  
7 number associated with data within the block of data; and a link field containing the  
8 virtual address of another data structure of the plurality of data structures.

1 20. (previously presented) The system of claim 11 wherein the data to be sent  
2 to the destination is stored in the memory, and wherein at least one of the host and the  
3 sending agent is adapted to:  
4 pin the locations of the memory storing the data to be sent to prevent the  
5 data to be sent from being swapped to the data storage;

6                    wherein the host is further adapted to provide to the sending agent in  
7   addition to the virtual memory addresses of the data to be sent, the physical addresses of  
8   the locations of the memory storing the data to be sent;

9                    wherein the sending agent is further adapted to retrieve from the pinned  
10   locations of the memory, the data to be sent; and to unpin the pinned locations of the  
11   memory storing the data to be sent after the sending agent retrieves the data from the  
12   pinned locations of the memory storing the data to be sent;

13                  and wherein the sending agent in sending the identified data to the destination is  
14   adapted to send the identified data in data packages over a network to the destination in  
15   accordance with at least a transport protocol.

1                  21. (previously presented) An article of manufacture for sending data from a  
2   source to a destination, the operations comprising:

3                    a host of the source providing to a sending agent of the source, virtual  
4   memory addresses of data to be sent to a destination wherein the data is stored in a  
5   plurality of unpinned physical locations of the source, each location having a physical  
6   address and a virtual memory address which is mapped to the physical address;

7                    the sending agent providing to the host of the source at least some of the  
8   virtual memory addresses of the data to be sent to the destination;

9                    the host of the source identifying to the sending agent the data addressed  
10   by the virtual memory addresses provided by the sending agent; and

11                  the sending agent sending the identified data to the destination.

1                  22. (original) The article of manufacture of claim 21 wherein the host identifying  
2   data comprises the host providing to the sending agent the data addressed by the virtual  
3   addresses provided by the sending agent, said operations further comprising the sending  
4   agent storing the data received from the host in a buffer of the sending agent.

1                  23. (original) The article of manufacture of claim 21 wherein the host identifying  
2   data comprises the host providing to the sending agent the physical addresses of the

3 locations containing the data addressed by the virtual memory addresses provided by the  
4 sending agent.

1 24. (original) The article of manufacture of claim 23 wherein the physical  
2 locations include locations of a first memory and locations of a second memory and the  
3 data identified by the host is stored in the first memory and the physical memory  
4 addresses provided by the host are physical memory locations of the first memory  
5 containing the data addressed by the virtual addresses provided by the sending agent, the  
6 operations further comprising pinning the physical memory locations of the first memory  
7 provided by the host to the sending agent to prevent the data addressed by the virtual  
8 addresses provided by the sending agent from being swapped to the second memory.

1 25. (original) The article of manufacture of claim 24 wherein the operations  
2 further comprise:

3 the sending agent retrieving from the pinned physical memory locations  
4 of the first memory, the data addressed by the virtual addresses provided by the sending  
5 agent; and

6 unpinning the pinned physical memory locations of the first memory after  
7 the sending agent sends to the destination the data addressed by the virtual addresses  
8 provided by the sending agent.

1 26. (original) The article of manufacture of claim 21 wherein the operations  
2 further comprise receiving from the destination an acknowledgment for data successfully  
3 sent by the sending agent and received by the destination; wherein the virtual memory  
4 addresses provided by the sending agent to the host are the virtual addresses of data sent  
5 by the sending agent to the destination but not acknowledged as successfully received by  
6 the destination.

1 27. (original) The article of manufacture of claim 21 wherein the operations  
2 further comprise:



3 receiving from the destination an acknowledgment for data successfully  
4 sent by the sending agent and received by the destination;  
5 the sending agent providing to the host the virtual addresses of data sent  
6 by the sending agent to the destination but not acknowledged as successfully received by  
7 the destination;  
8 the host identifying to the sending agent the unacknowledged data  
9 addressed by the virtual memory addresses provided by the sending agent; and  
10 the sending agent resending the identified unacknowledged data to the  
11 destination.

1 28. (original) The article of manufacture of claim 21 wherein the host providing  
2 virtual addresses to the sending agent includes the host providing to the sending agent at  
3 least one data structure which includes in an address field containing the virtual address  
4 of one of a plurality of memory locations storing a block of data to be sent to the  
5 destination, a size field containing a value representing the size of the block of data; and a  
6 sequence number field containing a value representing a packet sequence number  
7 associated with data within the block of data.

1 29. (original) The article of manufacture of claim 21 wherein the host providing  
2 virtual addresses to the sending agent includes the host providing to the sending agent a  
3 plurality of data structures, wherein each data structure includes in an address field, the  
4 virtual address of one of a plurality of memory locations storing a block of data to be sent  
5 to the destination, a size field containing a value representing the size of the block of  
6 data, a sequence number field containing a value representing the packet sequence  
7 number associated with data within the block of data; and a link field containing the  
8 virtual address of another data structure of the plurality of data structures.

1 30. (previously presented) The article of manufacture of claim 21 wherein the  
2 physical locations include locations of a first memory and a second memory and the data  
3 to be sent to the destination is stored in the first memory, the operations further  
4 comprising,

5                   pinning the locations of the first memory storing the data to be sent to  
6   prevent the data to be sent from being swapped to the second memory;  
7                   the host providing to the sending agent in addition to the virtual memory  
8   addresses of the data to be sent, the physical addresses of the locations of the first  
9   memory storing the data to be sent;  
10                  the sending agent retrieving from the pinned locations of the first  
11   memory, the data to be sent; and  
12                  unpinning the pinned locations of the first memory storing the data to be  
13   sent after the sending agent retrieves the data from the pinned locations of the first  
14   memory storing the data to be sent;  
15                  and wherein the sending by the sending agent of the identified data to the  
16   destination includes sending the identified data in data packages over a network to the  
17   destination in accordance with at least a transport protocol.